structions of cell movement, are important for refining the theoretical models of cell movement. With these refined techniques, a picture is emerging of cell movement as a complex process in which detailed analysis of the basic phenomena—such as the extension of a pseudo- or lamellipodium—continues to produce challenging results.

Analyses of cell migration *in vitro* and in developing embryos puts the processes and mechanisms of cell movement into an interesting context. Now the problems become much more difficult, and include understanding the directionality of migration and the interactions of migrating cells with neighboring cells and the environment (*e.g.*, the extracellular matrix).

How the topography of the substrate influences cell migration is given a good treatment in a separate chapter, and the migration and fate of cells in developing embryos is treated in two chapters. One long chapter deals with teleost fish embryos; it gives a very good review of the role of cell behavior in cleavage, gastrulation and organogenesis. Another chapter is restricted to neural crest cell migration in the chick embryo. In both these organisms the relative transparency of embryos, combined with the use of intercellular markers, has made possible detailed analysis of cell migration and fate in the living embryo.

Common themes run through most chapters in the book. One prominent theme is that many techniques are developed with the explicit goal of facilitating comparisons between normal and aberrant cell behaviors. Analysis of mutants, drug-treated cells or transformed cells is bound to be enhanced greatly by many of the fascinating new techniques described herein.

The selection of what to cover and which authors to invite is always difficult. In the present volume, all authors are from British or American laboratories, and this gives a somewhat misleading impression of the research field. The editors could have cast their net somewhat more widely.

There is little integration between different approaches, and one would have wished for more firm editing. Is it stands, this is not a suitable textbook, but several individual chapters can be used for in-depth coverage of specialized topics in an advanced cell or developmental biology course. The book is very suitable for students who do their honor's or graduate work within the field, and it is a must for researchers in the cell motility/cell migration field. The book has a useful index, which makes it easy to find the subject of interest, even when treated in several chapters.

The most pleasing feature of "Motion Analysis of Living Cells" is the broad coverage of topics, which I hope will induce increased integration into this research field. We have a lot to learn from each other, and the chapters in this book go into enough detail to make it possible to understand not only the technical apparatuses developed in different laboratories, but also the questions being asked and what the answers might turn out to be at the end of the day.

The least satisfying aspect is that it is hard to get a feeling for the dynamics of cell movement from reading about it, and one wishes for moving images to illustrate the text. I sincerely hope that there will be another edition of this book, and that it will include movies as illustrations of cell behavior and internal processes in moving cells.

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*Survival Strategies: Cooperation and Conflict in Animal Societies.* RAGHAVENDRA GADAGKAR. Harvard University Press, 1997, 196 pages. (ISBN 0-674-17055-5, $22.00.)

This is a book about animal social behavior for the curious amateur, for the teacher who would like a clearly presented introduction to the basic principles of sociobiology complete with a wide range of examples, and especially for the pre-biologist—the interested student eager to explore the hidden lives of wildlife, ranging from the solitary habits of mosquitoes to the cooperative prides of lions. Gadagkar's writing is lively and personal; the reading is effortless.

The book is written in ten chapters. The first two chapters introduce the basic concepts, beginning with the distinctions between solitary and social animals, the evolutionary problem of sociality via altruism, and the basic precepts of evolutionary approaches to behavior. All this is approached by first illustrating the issues with interesting descriptions of behavior, ranging from infanticide in hanuman langur monkeys to son-killing intracellular parasites, among just some of the fascinating examples. Gadagkar uses this approach throughout the book; he first sets up the problem by describing marvelous examples of animal behavior, then he explains how biologists theorize solutions to the problem, and finally he tops this off with fresh examples that provide independent support for the ideas. The result is that biological problems are encountered and solved in the way the biologists actually approach them, and never as a dry, abstract theorem removed from the real world.

The middle part of the book, chapters 3 through 6, develops the major concepts of sociobiology, explaining that animal behavior, like the shape and color of animal bodies, is amenable to natural selection owing to underlying genetic influences. It then describes the four most basic forms of social interaction—altruism, cooperation, selfishness and spite—followed by the concepts of inclusive fitness and reciprocal altruism, again with exciting examples such as blood-sharing in vampire bats and suicide in cellular slime molds.

The following four chapters further develop the theoretical concepts presented in the first part of the book while simultaneously taking on a more personal flavor. Chapter 7 deals with Gadagkar's favorite group of animals, the paper wasps. The section gives insights into the methods of a working insect behaviorist as well as giving the best demonstration of the application of theory to real, functioning animal societies. Chapters 8 and 9 discuss game theoretic approaches and the causes of conflict within normally cooperative groups.

The highlights of the book are the taxonomic breadth of the examples—the lives of mosquitoes are

compared to those of tigers and the lives of lions to those of bees—the personal accounts of observing intimate details of the social relationships of an extended family of wasps, and especially the heavy use of supporting examples from Asia. This gives a refreshing contrast to the usual American and European biases found in most similar books of this nature.

We have few complaints about the book. There are a few inaccuracies; for example, the mechanism of cricket singing (crickets sing by rubbing their forewings together, not their legs). The main title, *Survival Strategies*, conjures visions of defensive armor, distasteful poisons, and matching background colors in order to avoid being killed, but these are not really the issues at stake here. It's a book about how animals get along with each other; why they cooperate and why they sometimes fight and compete despite being parts of the same social group. For sure, the substance of the book is more accurately portrayed by the subtitle, *Cooperation and Conflict in Animal Societies*.

The last chapter finally switches from what we study about animal behavior to how we study it. Gadagkar essentially makes two points about the pathway by which sociobiology should proceed. The first is that, although simplifying assumptions about the process of evolution and the mechanisms of behavior have been an absolute necessity in the development of sociobiology, explicit analyses of these assumptions will almost certainly provide fruitful insight into our future understanding of the evolution of behavior. The second point is a note of caution that the molecular revolution in evolutionary biology shouldn't come at the expense of basic documentation and experimentation on lives of fully functioning organisms. The theories suitable for explaining this variation are young; most developed within the last few decades and we've only begun to tap into this diversity. This book will be an entertaining read for all the non-specialists interested in a vivid and up-to-date account of the evolution and dynamics of social life in animals.

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Molecular Evolution and Adaptive Radiation. THOMAS J. GIVNISH AND KENNETH J. SYTSMA, EDS. Cambridge University Press, Cambridge, 1997, xvii + 621 pages., (ISBN 0-521-57329-7).

With the introduction of the polymerase chain reaction to evolutionary biology about 10 years ago (Kocher *et al.*, 1989), the field of molecular systematics has been broadened to the point where molecular evolutionary analysis of DNA sequence data is now commonplace. These newly attained empirical heights have brought a rapid maturity to the field in terms of the rigor with which evolutionary trees are built, analyzed, and used to test hypotheses. With all the excitement, however, molecular systematists have rarely taken the time to step back and view the diversity of the field in a broad phylogenetic and molecular evolutionary context. Although Givnish and Sytsma's new book provides a somewhat restricted overview of topics and approaches that might have been included in a volume with its title, it nonetheless offers a detailed perspective on "case studies" that blend the richness of natural history with modern phylogenetics. It also will help molecular systematics (*sensu stricto*) assess its current status and future directions.

This new book is a collection of 21 chapters divided among seven broad categories: Introduction, Integrative studies, Convergence, Rapid radiations, Reproductive strategies, Character divergence and community assembly, and Macroevolutionary Patterns. It heavily emphasizes one of the two themes in its title—adaptive radiation. What discussions of molecular evolution there are pertain to ways of dealing with natural molecular evolutionary processes that result in homoplasy and which stand in the way of the ultimate goal—recovery of the phylogenetic tree of organisms. There are brief discussions scattered throughout the book of other ways in which gene trees might not reflect, or in some cases might patently conflict with, species trees (*e.g.*, retention of ancestral polymorphisms or hybridization). Nevertheless, homoplasy is generally considered the primary cause of such discrepancies and, pointedly, a nuisance—which it is, if the organismal tree is the *raison d'être* of the study. However, molecular evolutionists, for whom the biological causes of homoplasy and the description of forces molding molecular variation are of primary interest, will find less of interest in this book than will molecular chroniclers of adaptive radiations.

Edited as it is by two plant evolutionary biologists, the book contains a healthy dose of chapters on molecular systematics of plants. The abundance of chapters on plants (8 of 21) should be refreshing even for animal or microbial systematists, as the field of systematics strives to become more taxonomically integrative (as evidenced by the recent shift in title of the premier journal in the field from *Systematic Zoology to Systematic Biology*). Two introductory chapters lay out important issues in the study of adaptive radiations. Chapter 1 by Givnish discusses definitions of adaptive radiation and the need for phylogenetic approaches to adaptive radiation studies. It provides an interesting analysis of several classical concepts in evolutionary biology, such as adaptation, ecological release, speciation and key innovation, and discusses how these concepts are interpreted in the light of modern phylogenetic trees. Chapter 2 by Givnish and Sytsma highlights the problem of homoplasy in phylogenetic reconstruction and its relationships to issues such as rates of evolution, number of taxa and number of characters. Recent work in this field is nicely reviewed. However, this chapter suffers from what seems at times a preoccupation with denigrating the influential paper by Sanderson and Donoghue (1989), which discussed correlates of homoplasy in morphological and molecular data sets. Although the chapter presents useful discussions on distinguishing convergence from homoplasy, and correctly points out that a major disadvantage of morphological characters is their inability to provide